Name:_____ Date:_____

A2&T: Factoring by grouping

Do Now

1) Solve for x: $x^{-3} = \frac{27}{64}$

2) What is the multiplicative inverse of $3i$?

3) Express in simplest radical form over a rational denominator:

$$\frac{3+\sqrt{5}}{3-\sqrt{5}}$$

Factor by grouping

Factor: $5a^3 - a^2 - 5a + 1$

Solution

(1) The product of the first and last terms is equal to the product of the two middle terms. Therefore, the polynomial is a product of two binomials:

$$5a^3 \cdot 1 \stackrel{?}{=} -a^2 \cdot -5a$$
$$5a^3 = 5a^3 \checkmark$$

(2) Find a common factor of the first two terms and then of the last two terms. Then, factor out the common binomial factor:

$$5a^3 - a^2 - 5a + 1$$
$$= a^2(5a - 1) - 1(5a - 1)$$
$$= (5a - 1)(a^2 - 1)$$

(3) The binomial factor $(a^2 - 1)$ is the difference of two squares, which can be factored into the sum and difference of the equal factors of the squares:

$$= (5a - 1)(a^2 - 1)$$
$$= (5a - 1)(a + 1)(a - 1)$$

Practice:

1) $x^3 - 3x^2 + 2x - 6$

2) $x^3 - 2x^2 - 7x + 14$

3) $x^5 - 2x^3 + 5x^2 - 10$

4) $x^5 - 2x^3 - 7x^2 + 14$

5) $x^3 - 9x + 2x^2 - 18$

6) $8x^3 + 4x^2 - 9 - 18x$

7) $x^3 + x^2 + x + 1$

8) $-9x^3 - 3x^2 + 3x + 1$

Mixed Practice:

In 27–39, factor each polynomial completely.

27. $a^3 + 3a^2 - a - 3$

28. $5x^2 - 15x + 10$

29. $b^3 - 4b$

30. $4ax^2 + 4ax - 24a$

31. $12c^2 - 3$

32. $x^4 - 81$

33. $x^4 - 16$

34. $2x^3 + 13x^2 + 15x$

35. $4x^3 - 10x^2 + 6x$

36. $z^4 - 12z^2 + 27$

37. $(c + 2)^2 - 1$

38. $4 - (y - 1)^2$

39. $x^2y - 16y$

40. $3(x - 1)^2 - 12$

41. $9 - 9(x + 2)^2$